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Remarks

This application has been reviewed in light of the Office Action of October 6, 2006. Claims 1-18 are pending, and all claims are rejected. In response, original claim 17 (first occurrence) is renumbered as claim 16; new claims 18-20 are added; and the following remarks are submitted. Reconsideration of this application, as amended, is requested.

Applicant thanks the Examiner for finding Applicant's claim numbering error.

Ground 1. Claims 1, 2, and 5-17 are rejected under 35 USC 103 over Morita U.S. Patent 4,468,853 in view of Studer. Applicant traverses this ground of rejection.

Studer is nonanalogous art

The present invention recites a solar cell in which a front electrode overlies an active semiconductor structure, and a back electrode is on the back side of the active semiconductor structure. The front electrode is made of four layers, a titanium layer overlying and contacting the active semiconductor structure front side, a diffusion layer overlying and contacting the titanium layer, a barrier layer overlying and contacting the diffusion layer, and a joining layer overlying and contacting the barrier layer.

Morita deals with solar cells having an active semiconductor structure and a front contact for making front-side electrical contact with the active semiconductor structure that generates an electrical potential.

Studer deals with microfluidic devices, not solar cells. Studer applies an adhesion layer of titanium to either glass or polymethylmethacrylate (PMMA), and then a layer of gold over the titanium adhesion layer. No layers overlie the gold layer.

Studer is nonanalogous art. Stated alternatively, Studer is not within the scope and content of the prior art that may be used in forming a sec. 103 rejection. Its teachings are therefore not properly combined with the teachings of Morita. To be analogous art and properly used in forming a sec. 103 rejection, a reference must be concerned with the same problem as another reference and the claims which are being addressed. See, for

example, Medtronic, Inc. v. Cardiac Pacemaker, Inc., 220 USPQ 97, 104 (Fed. Cir. 1983), stating: "Faced with a rate-limiting problem, one of ordinary skill in the art would look to the solutions of others faced with rate-limiting problems." Also, Stratoflex, Inc. v. Aeroquip Corp., 218 USPQ 871, 876 (Fed. Cir. 1983), stating: "The scope of the prior art has been defined as that 'reasonably pertinent to the particular problem with which the inventor was involved.'" In the present case, the inventor was concerned with solving a problem in the structure of a high-temperature solar cell; see the title, Background, and discussion of the invention. Studer has nothing at all to do with solar cells or high-temperature solar cells or solar-cell contacts, and therefore is not properly within the scope of the prior art. It is therefore not properly applied in rejecting the present claims.

Requirements for a sec. 103 combination rejection

MPEP 2142, under ESTABLISHING A PRIMA FACIE CASE OF OBVIOUSNESS, provides: "to establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. [citations omitted]. See MPEP para 2143-2143.03 for decisions pertinent to each of these criteria."

*First requirement--there must be an objective basis for combining
the teachings of the references*

The first of the requirements of MPEP 2142 is that "there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings." The present rejection is a sec. 103 combination rejection. To reach a proper

teaching of an article or process through a combination of references, there must be stated an objective motivation to combine the teachings of the references, not a hindsight rationalization in light of the disclosure of the specification being examined. MPEP 2142, 2143 and 2143.01. See also, for example, In re Fine, 5 USPQ2d 1596, 1598 (at headnote 1) (Fed. Cir. 1988), In re Laskowski, 10 USPQ2d 1397, 1398 (Fed. Cir. 1989), W.L. Gore & Associates v. Garlock, Inc., 220 USPQ 303, 311-313 (Fed. Cir., 1983), and Ex parte Levengood, 28 USPQ2d 1300 (Board of Appeals and Interferences, 1993); Ex parte Chicago Rawhide Manufacturing Co., 223 USPQ 351 (Board of Appeals 1984). As stated in In re Fine at 5 USPQ2d 1598:

"The PTO has the burden under section 103 to establish a prima facie case of obviousness. [citation omitted] It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references."

And, at 5 USPQ2d 1600:

"One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention."

Following this authority, the MPEP states that the examiner must provide such an objective basis for combining the teachings of the applied prior art. In constructing such rejections, MPEP 2143.01 provides specific instructions as to what must be shown in order to extract specific teachings from the individual references:

"Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention when there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in

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the art. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992)."

* * * * *

"The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990)."

* * * * *

"A statement that modifications of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a prima facie case of obviousness without some objective reason to combine the teachings of the references. Ex parte Levengood, 28 USPQ2d 1300 (Bd.Pat.App. & Inter. 1993)."

Here, there is set forth no objective basis for combining the teachings of the references in the manner used by this rejection, and selecting the helpful portions from each reference while ignoring the unhelpful portions. An objective basis is one set forth in the art or which can be established by a declaration, not one that can be developed in light of the present disclosure. In this case, it is argued that "It would have been obvious...to utilize the gold layer on top of the titanium layer as in Studer et al. within the device and method of Morita because the gold layer on top of the titanium layer provides improved adhesion to the surface..." This argument falls short, because it is the titanium layer that provides the improved adhesion (see Studer, last line on page 916 before the figure; see also para. [0016] of the present application), not the gold layer. The sole reason for introducing the teaching of Studer is to justify the addition of the gold layer, not the titanium layer, because Morita already has a titanium layer. The Examiner's stated basis misstates the reason for depositing the gold layer over the titanium layer. The gold layer is the topmost layer in Studer, not provided in combination with any other overlying layers as in Morita. The gold

diffusion layer of the present invention diffuses to the interface and to the front side of the active semiconductor structure, see para. [0030] of the present application.

If the rejection is maintained, Applicant asks that the Examiner set forth the objective basis found in the references themselves for combining the teachings of the references, and for adopting only the helpful teachings of each reference, while disregarding the unhelpful teachings of the reference. Thus, as it stands now, the invention as a whole is not prima facie obvious over the combined teachings of the prior art.

*Second requirement--there must be
an expectation of success*

The second of the requirements of MPEP 2142 is an expectation of success. There is no expectation of success...This requirement has not been addressed in the explanation of the rejection, and in any event more than Examiner's argument is required here.

As stated in MPEP 2142, "The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. [citations omitted]."

There is no expectation of success in the combination of the teachings of Morita and Studer. Studer requires that its combination of titanium and gold be deposited upon a glass or PMMA substrate. The resulting combination would have a glass or PMMA substrate, neither of which is an active semiconductor substrate. The use of a glass or PMMA substrate as required by Studer would render the device of Morita inoperable, because it would no longer be a solar cell. If it is argued that one would pick the substrate of Morita instead, then this is a hindsight reconstruction because the teaching from Studer would be altered. As noted, Studer requires that its titanium-gold layers be deposited upon glass or PMMA.

The glass of Studer is made of silica, an insulator, while the semiconductors of Morita are made of silicon. These are different materials with completely different chemistries, crystallographies, properties, and uses. (See Office Action, page 4, lines 8-10.)

*Third requirement--the prior art
must teach the claim limitations*

The third of the requirements of MPEP 2142 is that "the prior art reference (or references when combined) must teach or suggest all the claim limitations." In this regard, the following principle of law applies to all sec. 103 rejections. MPEP 2143.03 provides "To establish prima facie obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art. In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970)." [emphasis added] That is, to have any expectation of rejecting the claims over a single reference or a combination of references, each limitation must be taught somewhere in the applied prior art. If limitations are not found in any of the applied prior art, the rejection cannot stand. In this case, the applied prior art references clearly do not arguably teach some limitations of the claims.

Each of claims 1, 10, and 17 recites in part:

"a titanium layer overlying and contacting the active semiconductor structure front side,
a diffusion layer overlying and contacting the titanium layer,
a barrier layer overlying and contacting the diffusion layer, and
a joining layer overlying and contacting the barrier layer."

Morita teaches against this recitation by teaching that its palladium layer 112 is deposited directly on its titanium layer 110, see col. 4, first paragraph and Figure 4. Applicant can find nothing in either Morita or Studer that suggests placing a gold (or any other) layer between the titanium layer 110 and the palladium layer 112 of Morita, or suggests that any advantageous results would be obtained by placing a gold layer between the titanium layer 110 and the palladium layer 112 of Morita. Such teaching cannot come

from Studer, because Studer has no palladium layer (or anything like it), with the gold layer lying between the titanium layer and such a palladium layer.

Regarding the recited layer thicknesses of claims 8 and 14, Morita teaches that the titanium layer 110 is 1000 Angstroms in thickness, four times the maximum thickness recited in the present claims. Studer teaches a titanium layer thickness that is inconsistent with that taught by Morita. The explanation of the rejection (page 4, lines 14-15) suggests that the teaching of Morita is to be discarded and the teaching of Studer is to be adopted, but gives no objective reason that is found in either Morita or Studer. Instead, the substitution appears to be straightforward hindsight reconstruction.

The explanation of the rejection further argues that it would be obvious to choose the various layer thicknesses, see page 4, lines 16-21, and that the thicknesses "depend on a specific application." Applicant agrees that the references chose their thicknesses for their applications. Morita chose his thicknesses for a solar cell, and Studer chose his thicknesses for a microfluidic device. There is certainly no reason to substitute thicknesses from the field of microfluidics into the field of solar cells. The present claims recite preferred thicknesses chosen for very specific reasons, see para. [0030] of the present claims. Neither reference suggests varying its disclosed thicknesses for such reasons, and in fact neither reference suggests varying its disclosed thicknesses at all.

Applicant asks that the Examiner reconsider and withdraw this ground of rejection.

Ground 2. Claims 1, 5-7, 9-11, and 15-16 are rejected under 35 USC 103 over Chang U.S. Patent 5,330,585 in view of Lindmayer U.S. Patent 4,124,455. Applicant traverses this ground of rejection.

Applicant incorporates the discussion in response to the Ground 1 rejection, particularly as to the legal requirements.

*First requirement--there must be an objective
basis for combining the teachings of the references*

There is no objective basis to combine the teachings of these two references. Chang teaches the use of three layers in a contact--titanium, gold, and silver, although no order or relationship of these layers to each other or to the substrate is taught (col. 4, lines 43-46). Chang does not mention the use of platinum-group metals. Lindmayer teaches a different and specific combination of layers--titanium group element, a mixture of titanium group elements and platinum group elements overlying the layer of titanium group element, a layer of platinum group metal overlying the mixture layer, and a silver layer over the platinum-group layer (Abstract). Lindmayer does not suggest the use of gold.

The explanation of the rejection seeks to characterize the teaching of Lindmayer in a particular way so as to suggest broader applicability than Lindmayer's teaching and to fit the hindsight reconstruction of the present claims. Lindmayer does not teach "placing a layer of platinum below the layer of silver" (Office Action, page 5, last two lines on page). Lindmayer teaches a specific order of four layers, as set forth in the preceding paragraph, and there is no mention in Lindmayer of "placing a layer of platinum below the layer of silver."

At page 6, lines 1-5, it is argued that it would be obvious to use the platinum barrier layer of Lindmayer between the gold and silver layers of Chang. There is no reason to believe that the titanium, gold, and silver layers of Chang are in any particular order--Chang just mentions materials, but not any order at col. 4, lines 43-46. Further, the teaching of Lindmayer is for his particular structure, and there is no suggestion as to what might happen if a gold layer is introduced.

*Second requirement--there must be
an expectation of success*

There is no expectation of success in the proposed combination of teachings, because the Chang teaching is indefinite as to the order of the layers.

*Third requirement--the prior art
must teach the claim limitations*

Each of claims 1, 10, and 17 recites in part:

"a titanium layer overlying and contacting the active semiconductor structure front side,
a diffusion layer overlying and contacting the titanium layer,
a barrier layer overlying and contacting the diffusion layer, and
a joining layer overlying and contacting the barrier layer."

Chang has no teaching of any order in its layers of titanium, gold, and silver.

Lindmayer teaches the following set of layers--titanium group element, a mixture of titanium group and platinum group elements overlying the layer of titanium group element, a layer of platinum group metal overlying the mixture layer, and a silver layer over the platinum-group layer (Abstract).

Neither reference teaches "a diffusion layer overlying and contacting the titanium layer," as recited in the present claims.

Applicant asks that the Examiner reconsider and withdraw this ground of rejection.

Ground 3. Claims 3-4 are rejected under 35 USC 103 over Morita in view of Studer, and further in view of Salami U.S. Patent 5,928,438. Applicant traverses this ground of rejection.

Applicant incorporates the discussion in response to the Ground 1 rejection.

Claims 3-4 depend from claim 1 and incorporate its limitation. Claim 1 is patentable over the combination of Morita and Studer for the reasons discussed earlier, and which are incorporated here. Salami adds nothing in this regard, and introduces considerable confusion as will be discussed subsequently. Claims 3-4 are therefore patentable as well.

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*First requirement--there must be an objective
basis for combining the teachings of the references*

There is no basis for combining the teachings of Morita and Studer for the reasons discussed earlier. Salami teaches that its electrical contacts are made of aluminum with an overcoat of a solderable material such as silver, see Abstract, col. 4, lines 48-52, the extensive discussion of the requirement to use aluminum throughout Salami, claim 1 at col. 8, lines 10-12, and claim 16 at col. 8, lines 59-60.

None of the references suggest that the disparate teachings of the three references may be combined.

*Second requirement--there must be
an expectation of success*

There is no expectation of success, because of the different contact structures that are taught by the three references.

*Third requirement--the prior art
must teach the claim limitations*

Claim 3 recites in part: "the front electrical contact comprises a current collector."
Claim 4 recites in part: "the front electrical contact comprises a current collector."

To understand what is meant by "front electrical contact," reference must be made to claim 1. Claim 1 recites in part:

"...the front electrical contact has multiple layers comprising:

- a titanium layer overlying and contacting the active semiconductor structure front side,
- a diffusion layer overlying and contacting the titanium layer,
- a barrier layer overlying and contacting the diffusion layer, and
- a joining layer overlying and contacting the barrier layer."

Morita teaches against this recitation by teaching that its palladium layer 112 is deposited directly on its titanium layer 110, see col. 4, first paragraph and Figure 4. Applicant can find nothing in either Morita or Studer that suggests placing a gold (or any other) layer between the titanium layer 110 and the palladium layer 112 of Morita, or suggests that any advantageous results would be obtained by placing a gold layer between the titanium layer 110 and the palladium layer 112 of Morita. Such teaching cannot come from Studer, because Studer has no palladium layer (or anything like it), with the gold layer lying between the titanium layer and such a palladium layer.

Salami teaches against the recited structure. Salami teaches that its electrical contacts are made of aluminum with an overcoat of a solderable material such as silver, see Abstract, col. 4, lines 48-52, the extensive discussion of the requirement to use aluminum throughout Salami, claim 1 at col. 8, lines 10-12, and claim 16 at col. 8, lines 59-60. If the teaching of Salami regarding current collectors and busbars is to be adopted, then the central teaching of Salami of an aluminum-silver contact structure cannot be ignored and must also be adopted. To do otherwise would be a hindsight reconstruction. The structure taught by the three references then does not meet the claim limitations.

Applicant asks that the Examiner reconsider and withdraw this ground of rejection.

Applicant submits that the application is in condition for allowance, and requests such allowance.

CONCLUSION

In view of the above, Applicant respectfully requests reconsideration of the Application and withdrawal of the outstanding objections and rejections. As a result of the amendments and remarks presented herein, Applicant respectfully submits that claims are not anticipated by nor rendered obvious by the cited art either alone or in combination and thus, are in condition for allowance. As the claims are not anticipated by nor rendered obvious in view of the applied art, Applicant requests allowance of all of the remaining claims in a timely manner. If the Examiner believes that prosecution of this Application could be expedited by a telephone conference, the Examiner is encouraged to contact the Applicant.

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This Response has been filed within three (3) months of the mailing date of the Office Action and it is believed that no fees are due with the filing of this paper. In the event that Applicants are mistaken in their calculations, the Commissioner is hereby authorized to deduct any fees determined by the Patent Office to be due from the undersigned's Deposit Account No. 50-1059.

Applicant respectfully requests entry of the above amendment and allowance of the claims.

The Commissioner is hereby authorized to charge any additional fees and credit any overpayments to Deposit Account No. 50-1059.

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